



National Aeronautics and
Space Administration

New Millennium Program

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Project/Mission Confirmation Review Planning Guidelines

April 30, 2002

Version 0

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Approved:

Dr. Christopher M. Stevens, Manager
New Millennium Program

Concurred:

Ludwig E. Schuster,
Program Coordinator for Technology
Office of Earth Science

Charles Gay, Program Executive
Office of Space Science

1.0 Introduction

The New Millennium Program is a cross-enterprise technology program jointly funded and managed by the SSE and ESE. Its purpose is to develop and flight validate breakthrough technologies to retire risk for first use to significantly benefit future space science and Earth science missions. Both the SSE and ESE utilize the NMP as a primary path to flight validate key emerging technologies to enable exciting 21st century science missions.

The objectives of the New Millennium Program, as defined in the NMP Program Commitment Agreement are:

- To identify and select technologies for flight validations that optimize the benefits to the SSE and ESE;
- To develop and implement effective flight projects that include technology development and flight validation to mitigate the risks for using the selected technologies in science missions; and,
- To facilitate the infusion of the validated technologies into science mission opportunities.

A Confirmation Review process is required for all New Millennium Program (NMP) projects. The review process culminates in a Mission Confirmation Review (MCR) at NASA Headquarters. NMP projects are either selected by the Space Science or Earth Science Enterprises, or solicited and selected through NASA Research Announcements (NRA) or Technology Announcements (TA) within the New Millennium Program.

The purpose of the Confirmation Review process is to establish that the project team has completed an acceptable project Formulation and is prepared to proceed with the Implementation phase to complete the flight and ground system development and mission operations within the identified cost and schedule for the project. A Confirmation Assessment (CA) is typically made at the end of the Formulation Refinement phase of Formulation and prior to the initiation of full-scale flight hardware/software development (Implementation). In preparation for the CA and in order to minimize the duplication of efforts on the part of the project team, the CA Board will participate with the Implementing Center's Preliminary Design Review (PDR) Board in the Project PDR.

The CA Board will be co-chaired by an independent expert appointed by the JPL New Millennium Program Office and a co-chair from the JPL Systems Management Office, with the concurrence of the Cognizant Enterprise Associate Administrator (EAA). The New Millennium Program Office, in concert with the Cognizant Enterprise Program Executive and the co-chairs, will select review board members to assess the technical maturity of the project, the robustness of the implementation and management approach, and the ability to meet program commitments.

The findings from the CA, the commitment from the implementing Center and the recommendation from the NMP Manager are then presented to the JPL Governing Program Management Council (GPMC). Presuming an endorsement from the JPL GPMC, the Implementing Center commitment, and written findings from the CA and the GPMC, along with

the NMP Program Manager's assessment, will be presented to the Cognizant EAA. At the EAA-chaired Mission Confirmation Review (MCR), the EAA reviews the project's plans, documentation, results of the independent review and the findings, the implementing Center commitment and the recommendation of the GPMC, and either approves the project for implementation, directs that project formulation continue, or cancels the project.

2.0 Application

The intent of this document is to provide guidance to NMP Projects in Formulation concerning the plan for reviewing the Project to assess its readiness for Project/Mission Confirmation. The guidelines in this document are traceable to the NMP Program Plan.¹ Where conflicts exist between this document and the NMP Program Plan, the Program Plan shall take precedence. This document amplifies on Sections 5.0 and 17.0 of the NMP Program Plan.

3.0 Objective

The objective of the New Millennium Program Office Project /Mission Confirmation process is to provide the NMP Office, the JPL Program Management Council (PMC) and the Cognizant EAA with an independent assessment of project readiness to proceed into the Implementation phase by identifying the technical, financial, management and programmatic risks associated with project development and operations, and to recommend actions to reduce or mitigate the risks to a level appropriate for the risk category and scope of the project. The products of this process are:

1. A presentation of the findings and recommendations of an independent CA is required for the New Millennium Program Manager and the PMC of the implementing Center. These findings will be provided to the individual Project/Mission Manager and his/her team for feedback and resolution of outstanding actions. The criteria for this review are defined in this plan.
2. A presentation of the findings of the CA, and implementing Center and Project team responses to the findings, will be made to the NMP Manager and the JPL PMC.
3. The written findings from the CA and the JPL PMC, along with a letter of commitment from the implementing Center, will be presented to the Cognizant EAA for review at the Mission Confirmation Review (MCR).

4.0 Scope

The New Millennium Project/Mission Confirmation process will assess the complete life-cycle of the project/mission, including the system design (hardware and software), deliverable technology validation data products, launch vehicle interface, and processes and procedures that will be used in the conduct of the project. The focus of the process is on the project team's ability to meet technical, cost and schedule commitments as documented in the Project Level 1 Requirements. Design, technology maturation, hardware manufacturing and software

development processes; and test procedures, facilities and product assurance processes; are included within the scope of the assessment.

5.0 Ground Rules

- a) The CA Board will consist of experts from appropriate disciplines who are independent of the New Millennium Program Office and the project/mission to be reviewed.
- b) The CA Board deliberations may be conducted in closed session at the discretion of the chairperson.
- c) The technology validation data deliverables of an individual project/mission are defined in the Project Level I Requirements for that project. The board will assess the project readiness for Confirmation based on the credibility and thoroughness of the Project Plan to deliver the technology validation data products as defined in the above documentation.
- d) If the Project Level 1 Requirements have changed significantly since the selection of the project to proceed into Formulation Refinement, NMP shall convene a stakeholder review of the requirements to determine the relevance and value of the project to future science missions.

6.0 Nominal Schedule

Confirmation Assessment	2-3 days
Panel member reports due to Chairperson	At conclusion of review
Debrief Project and NMP	At conclusion of review
Draft CA Board Report	Within one week of review completion
Project Team Response	Within 3 weeks of review completion
Final Report of CA Board	Within 4 weeks of review completion
NMP/Project/CA report to JPL PMC	Within 6 weeks of review completion
HQ Mission Confirmation Review	Within 7 weeks of review completion

7.0 Confirmation Assessment Review Organization

The CA Board is led by the Co-Chairs, who will coordinate with the Project/Mission Manager and the chair of the implementing Center's Project Standing Review Board, to ensure that the team has access to sufficient information to accomplish its objective with a minimum impact to the project. They will coordinate the review panel activities and present the findings. The membership of the team is at the discretion of the NMP Office and the Co-Chairs, with concurrence from the Cognizant Enterprise representative.

8.0 Review Process

The Confirmation Assessment typically will be held at the implementing Center over a 2-3 day period. If the NMP Manager and the Implementing Center agree that a combined project PDR and CA is the optimal approach, the review will be held at a mutually agreed upon location. The board will meet at the conclusion of each day to discuss the results of the day's presentations and develop their preliminary findings and recommendations. Board members should be prepared to brief the CA Co-Chairs on their findings from their assigned areas at these evening sessions. The evening sessions will also be used to integrate findings among the panel members. At the conclusion of the review, each member will provide the Co-Chairs with a summary of their findings, as well as any specific action items or recommendations they have identified. The Co-Chairs will debrief the Project /Mission Manager, and the NMP Manager on the review board findings at this time. The CA board will produce a draft report and distribute the report to the project, NMPO and the Cognizant Enterprise Representative. The Project Manager and the project team will develop responses to the board findings, which will be coordinated with the CA Co-Chairs. The CA Co-Chairs will then produce a final CA report and present their findings, recommendations and Project team responses to the JPL Program Management Council. Additionally, the NMP Manager will provide his/her programmatic assessment of the project's readiness to proceed into Implementation to the JPL PMC. The findings and recommendations of the JPL PMC will be documented and presented to the Cognizant EAA at the MCR for approval of the project to proceed into Implementation. In order to minimize the impact on the project resources and schedule, the entire Confirmation process should be completed within approximately two months.

9.0 Requirements for Project Approval

Each NMP project shall proceed into the Implementation Phase only after the project has obtained approval from the EAA. Projects shall satisfy the following criteria to obtain approval:

- The draft Project Level 1 Requirements have been approved
- The preliminary Project Plan conforms to the requirements defined in NPG 7120.5 and the NMP Program Plan
- The selected technologies for the project have achieved a level of technology maturity that will enable the project to incorporate the technologies into the flight system with an acceptable level of risk and the design rules for utilizing the technologies are well understood
- Technology readiness assessment gates (e.g., brass board or an engineering unit) have been defined and scheduled for each technology included in the project
- A Project Technologist serves on the project implementation team
- Solicitation and selection of the industry spacecraft partner, testbed provider, or instrument integrator have been completed, where applicable
- Where appropriate, science participation via an Announcement of Opportunity or NRA has been obtained
- A confirmed access to space as part of the project baseline has been explicitly approved by NASA Headquarters where appropriate (for projects planned as secondary launches, see section 10.1 below)

- A cost estimate completion has been independently assessed in the Mission Confirmation Review process to ensure that the budget, schedule, and technical performance assumptions and margins are adequate, attainable, and consistent with the commitments and constraints in the NMP PCA
- Resource control systems are in place to review and measure resource expenditure versus the plan
- A NEPA Notice or NEPA Environmental Assessment has been made that results in a “Finding of No Significant Impact” (FONSI)
- A successful Confirmation Assessment has been performed
- A draft Press Release to be issued by the applicable EAA upon completion of Approval is available
- The project’s implementing Center PMC and the JPL PMC (NMP GPMC) have reviewed the project status, including the results from the CA, the implementing Center has provided a written commitment to the Project Level 1 Requirements and the JPL PMC has recommended that the project is ready to proceed into the Implementation phase

10.0 Mission Confirmation Review Criteria for Launch Vehicle Accommodation on Missions Utilizing Secondary Payload Opportunities

Background

The NMP has been restructured to add the category of technology subsystem validation projects, while retaining the system validation category. The focus of subsystem validation projects is on individual technology subsystems that can be validated as stand-alone items, as opposed to the system validation in which a suite of technologies are tested together to validate critical system-level functions. In the restructuring, it is also the goal of the program to rely heavily on secondary payload opportunities in order to reduce the funding required for access-to-space and to focus the program investments on technology advancement. It is expected that future NMP projects will be smaller scale than the DS 1/EO 1-type mission, thereby making these projects more amenable to accommodation as secondary payloads.

A significant barrier that currently exists to planning launch opportunities for secondary payloads is that these opportunities can not usually be identified until much closer to launch than traditional primary payload projects. The uncertainty associated with the launch date and mass reserves of a primary payload is often considerable, and the action of coupling a secondary payload (along with its own uncertainties) too early arguably introduces constraints that may pose a financial and technical risk to the development of both payloads. Given the probable lack of specific launch vehicle assignment at the traditional Formulation/Implementation transition point (i.e. Mission Confirmation Review), a new set of criteria is proposed to address the launch vehicle accommodation issues for projects planned as secondary payloads. The set of issues that should be addressed in the Mission Confirmation Assessment process is described below. A qualitative evaluation of the project readiness with respect to these issues will serve as guide as to whether the project should be confirmed to proceed into implementation.

Information required on secondary payload launch vehicle accommodation at Mission Confirmation

A. Interface Assumptions

The project shall define a set of preliminary launch vehicle technical interface assumptions. A representative list is shown below:

Mechanical interface information:

1. Mechanical interface loads
2. Specific details regarding the mechanical attachment and release mechanism
3. Volume available within the fairing
4. Launch pressure profile

Electrical interface information:

1. Electrical connection to the launch vehicle
2. Electrical separation signal
3. Payload “aliveness test” capability

Ground interface information:

1. Battery charging
2. Air conditioning
3. Special gaseous purge requirements
4. Thermal environment control
5. Physical access to spacecraft on launch pad

Ground Payload Processing information:

1. Delivery timeline
2. Processing flow information
3. Special handling requirements

Thermal interface

1. Thermal interface during ascent
2. Thermal interface during release

The project shall identify the specific types of launch vehicles that can support this set of interface assumptions for secondary payloads.

B. Cost assumptions:

The following cost information is required:

1. The apportioned launch vehicle cost for the secondary payload
2. The cost (if additional) for ground payload processing
3. The cost associated with launch support

The basis of the cost estimate shall be stated. It is desirable that the potential launch service providing organization(s) submit any supporting cost estimation information in writing to the project for the Mission Confirmation Assessment.

C. Orbit assumptions:

1. Baseline orbit for mission design
2. Range of acceptable orbital parameters

D. Programmatic assumptions:

1. Project shall provide an assessment of the probability of availability of suitable secondary payload opportunities in the targeted launch period;
2. Project shall define the plan leading to a confirmed secondary payload agreement and discuss the realism of the plan; and
3. Project shall define the schedule to secure a confirmed secondary payload agreement and specify the date of an access-to-space confirmation review.
4. At the access to space confirmation review, the project must demonstrate that the chosen approach is consistent with the project plan and resources.

Project/Mission Confirmation Process

During the Project/Mission Confirmation process, the project's responses to the secondary payload accommodation issues will be evaluated by the CA board, the NMP GPMC, and the MCR board. The robustness of the project design to meet the potential secondary payload launch vehicle interfaces, the likelihood of obtaining an appropriate secondary payload launch and the reasonableness of the assumed launch-related costs will be assessed. A project can be confirmed to proceed into implementation without a confirmed launch accommodation agreement, if it is judged by this review process that the issues are adequately addressed and the cost estimates are properly bounded.

11.0 Confirmation Assessment Review Criteria for Success

- 1. The Project Level 1 Requirements are appropriately focused on adequately demonstrating the required capability for future science missions and are clearly defined. The requirements flow-down is satisfactory and the technology validation experiment(s), mission, spacecraft and payload designs as presented, reflect a level of maturity that will allow achievement of the Level 1 Requirements.**

Scope of Criterion 1 - Indicator questions

What are the Project Level 1 Requirements? Are the requirements well documented and understood by the project team? Are the requirements different from the stated requirements at the completion of Concept Definition (Phase A)? If there are changes to the Level 1 Requirements, has there been a stakeholder review of the changes? What were the findings from the review? Does the stakeholder community endorse the value of the project given the revised Level 1 Requirements? (Note: stakeholders are the signatories to the Project Level 1 Requirements document.)

Are the Project Level 1 Requirements traceable to the project Technology Validation Plan? How have requirements been allocated to each project element, e.g. spacecraft, payload, ground system? What is the status of requirements allocation to subsystems of each element?

What is the status of the hardware and software being developed for the mission? What technology maturation development and test activities have been completed since project selection for Formulation Refinement? Have the Technology Providers met their agreed-upon Technology Readiness Gates? What critical activities (design, tests, etc.) remain to assure the hardware and software can be included in the mission?

What are the key technical metrics used by the project? What is the status and trend of each?

What are the results of analyses, tests and design activities related to the hardware and software developments?

What system level trades have been completed? What are the remaining trade studies that must be completed?

What is the specific design and/or flight heritage of the spacecraft/platform systems and payload?

What is the status of the definition of the primary interfaces, e.g., payload/spacecraft, spacecraft/LV, spacecraft /ground? What design, test, and integration tasks are allocated to NASA, or other government agencies?

What is the status of the software design? How has software been estimated for each element and subsystem? How have margins been allocated to accommodate any technologies affecting the software?

Does the project Technology Validation Plan adequately define the tests and data requirements for the validation experiments? What validation/calibration is needed/planned prior to launch to ensure technology validation requirements are met? What is the post-launch validation plan to be accomplished during operations? What critical data is needed during operations and how is the data to be captured and processed?

Does the project integration and test plan adequately address the test requirements at each level of integration?

Is the mission operations concept defined in sufficient detail to support the estimate of the cost for mission operations?

Has the ground system architecture been defined in sufficient detail to estimate the cost for its development?

Does the Product Assurance Plan adequately describe the project approach to product assurance? Is the product assurance approach consistent with the scope and risk category of the project?

2. The project implementation organization and supporting management oversight and control processes used by the Project Team are sufficient to develop and operate the mission.

Scope of Criterion 2 - Indicator questions

Is the system engineering management approach well defined?

Are the roles and responsibilities of all participating organizations clearly defined? Are Memoranda of Agreement and/or Work Package Agreements in place that reflect the roles, responsibilities and commitments of each organization? Do the key project personnel in each organization have the requisite experience for their roles? What processes are in place for making, communicating and implementing project decisions? What project management system, in place or planned is used to track the status of each task and its deliverables?

Is there a common cost/schedule reporting system being utilized across the project?

What is the process for managing and implementing project descopes? Who has approval authority for implementing descopes?

What is the critical path and how is it being routinely assessed and managed?

Do the Work Breakdown Structure (WBS) and accompanying WBS Dictionary adequately define the scope of the project including the key receivables and deliverables? Have the critical long-lead parts and materials been identified with adequate schedule to accommodate their acquisition? What is the long-lead

procurement status?

Have all required facilities been identified and utilization plans developed? Are agreements in place for use of facilities for testing? What is the degree of schedule flexibility for high-demand facilities?

3. The scope of the project, estimated resource requirements, reserves, margins and schedule are consistent with an implementable project.

Scope of Criterion 3 - Indicator questions

Does the project assume funding applied to the project development and operations that is outside the project-controlled budget? If so, are there agreements in place for commitment of the necessary resources, including allocation of cost increases?

How does the current cost estimate and burn-rate compare to the baseline at start of Formulation Refinement?

What cost and schedule monitoring and control processes are in place? How is progress being measured? How are reserves allocated and released? Is there sufficient reserve in cost and margin in schedule to complete and deliver the flight system by the planned launch readiness date?

What incentives are in place to control cost and schedule? How are the program cost-caps reflected in contracts and allocated?

Is the basis of estimate well defined and credible from a “cost realism” standpoint? Is the project cost estimate consistent with independent cost model estimates?

Does the project Risk Management Plan adequately define the risk identification and mitigation process? What risks have been identified and what are the mitigation plans?

Does the project have a credible descope plan to manage cost and schedule risk in order to stay within the project budget? Have the specific descope actions been identified including the cost and schedule impacts for each and the decision milestones for executing descopes? What are potential mass, power, and software impacts for each descope option? What is the impact of each descope option on the

mission technology validation deliverables? Do any of the descope impact achievement of the Project Level 1 Requirements?

12.0 Topics to be covered in the NMP Confirmation Readiness Assessment

- Project Overview and Status
- Project Organization and Partnerships
- Project Plan and Work Breakdown Structure
- Measurement Concept (if applicable)
- Technology Validation Objectives
- Project Level 1 Requirements
- Mission and System Description
- Systems Management/System Engineering
- Technologies to be validated (Payload and Spacecraft)
- Spacecraft
- Launch Vehicle and Services
- Mission Assurance
- Mission Design
- Mission Operations and Ground System
- Validation Data Processing System
- Technology Infusion Plan
- Risk Assessment and Management
- Fault Tree Analysis and Probabilistic Risk Assessment
- Integrated Project Schedule
- Project Cost and Basis of Estimate
- Reserves and Margins Management
- Performance Measurement
